Final Contract Report

Health Information Technology and Mental Health: The Way Forward

Proceedings of a Summit on Health IT Solutions and Future Priorities for Advancing Mental Health

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Contents

Overview of Proceedings

A multidisciplinary group was convened November 16-17, 2010, in the DC Metropolitan Area to focus on health information technology (IT) and its role in mental health. The goals of the Summit were (1) to discuss the future direction of the field of IT for mental health and (2) to identify the top priorities in the field for advancement.

Approximately 35 professionals from across the country gathered to bring their perspectives and expertise to the discussion. They represented the fields of research, industry, medical and mental health practice, government, and consumer advocacy.

Day 1

Opening comments by several experts set the stage for the Summit. They helped to define the two major areas of focus of the Summit—Lessons from the Field: Health IT Solutions and Lessons From Industry: Fostering Partnerships between Industry and Academic Institutions.

Lessons From the Field included four sections:

- Section One: Evaluating the Promise of Health IT To Expand and/or Enhance Access To Mental Health Care and Prevention
- Section Two: Setting Research Priorities for Technology-Based Mental Health Interventions
- Section Three: Furthering the Reliable and Valid Measurement of Mental Health Screening, Diagnoses, Treatment, and Outcomes Through Health IT
- Section Four: Advancing the Adoption, Integration, and Testing of Technological Advancements Within Existing Care Systems

Each of these sections consisted of (1) a plenary presentation, (2) one or more technology demonstrations, (3) an overview of the supporting white paper, and (4) large group brainstorming and discussion of priorities. Day 1 of the Summit ended with a plenary presentation and technology demonstrations for Section Four.

Day 2

Highlights, key priorities, and main messages from the first day of the Summit were presented to kick off day 2. The remaining sessions of Section Four—overview of the supporting white paper and large group brainstorming and discussion—concluded presentations and discussions around lessons from the field.

A plenary session shifted the attention to the second focus area of the Summit— Lessons From Industry: Fostering Partnerships Between Industry and Academic Institutions. Speakers from

industry presented thoughts and examples of how industry and the profession can work together to advance health IT for mental health. Presentations were followed by facilitated discussion of highlights from the presentations.

The Summit ended with a prioritization process that summarized key ideas from the discussions and identified top priorities for research to advance health IT, particularly as it relates to mental health. Key ideas and research priorities centered around four areas:

- Expanding access to health care
- Setting research priorities for technology-based mental health
- Reliable and valid measurement
- Adoption, integration, and testing of technology in existing care systems

Next Steps

At the conclusion of the Summit, participants were reminded that their work was not done. The sponsors intend to reach out to attendees of the Summit and others to help organize, fund, and advance research to bring health IT to reality. Attendees were encouraged to pursue the ideas and research priorities that came out of the Summit in their individual capacities and within their respective organizations to help realize the ultimate goal of improving the diagnosis, treatment, and outcomes of individuals and populations dealing with mental health issues.

Setting the Stage

Introductory Remarks

Michael Klinkman, M.D., University of Michigan and TEP Chair, began by likening the group to a "think tank." He indicated that the group's task is to share thoughts and ideas while "keep[ing] the consumer voice in our head[s] as we have this discussion." He encouraged participants to approach the Summit as "all play," meaning that everyone's thoughts and perspectives are equally important.

In preparation for the Summit, a planning group identified four priority areas. White papers were developed around each of those areas to provide background in terms of what was already known and what questions still needed to be answered. Dr. Klinkman concluded his comments by encouraging the group to participate, have fun, "scribble, draw outside the lines, or do whatever you need to do" to help bring focus and forward thinking to the discussions.

Following Dr. Klinkman's opening remarks, participants introduced themselves by name and organization and briefly described their specific interest around the topic. From the introductions, it was apparent that there was a wealth of knowledge and expertise in the room to contribute to the discussions.

The second speaker was Jon White, M.D. Dr. White leads the Health IT Portfolio at AHRQ. He reminded the group to keep in mind, as they think through the issues and where resources should be allocated, that mental health is only part of a whole—the whole being health. Dr. White stated that he "would love to see good, focused output that describes the issues around which we need to do research."

Robert Heinssen, Director of Services and Intervention Research for the National Institute of Mental Health (NIMH), was the third speaker. He began by noting that the timing of the Summit was wonderful from the perspective of NIMH. "What started as a single, isolated project on ways to use [health] IT to affect interventions or improve assessment through screening, has turned into a trickle and seems like it is turning into even more." Mr. Heinssen identified three goals he would like to see accomplished: (1) improved effectiveness, (2) improved reach, and (3) improved quality of treatments. The purpose of the meeting, he said, is to "think through strategies for capitalizing on new technologies and ways of doing things."

Overview of Current Federally Funded Research on Health IT and Mental Health

The next speaker, Dave Chambers, D.Phil., NIMH, highlighted the lack of coordination of emerging work on health IT. He challenged the group to better prioritize this research space. The reality is that budgets are declining, while the cost of research, around health IT in particular, tends to be "on the higher end of things." Despite this, there has been a lot of talk

about how technology can enhance research. As a word of caution, Dr. Chambers pointed out that health IT is no longer innovative on its own merit. "There needs to be a shift," he said, "from a piece-meal approach to strategic thinking about the role we need health IT to play in mental health." In areas where there has been a fair amount of work done, most additional work would be incremental, not innovative. Dr. Chambers challenged the group to focus on the clear areas where development and advancement are needed and where certain questions have already been answered. He concluded his remarks by saying that more is not necessarily better and that "strategically less" may be better in some areas.

Adam Haim, Ph.D., NIMH, provided an overview of NIMH's IT portfolio. He talked about the types of grants NIMH is funding and not funding. Many of the currently funded grants have IT-enhanced technology as the primary driver, some involving multiple technologies. Two of the larger groups are multimedia and interactive technologies. Currently, NIMH is funding 34 Department of Scientific and Industrial Research grants representing $35 million in funding.

Michael Stiratt, Ph.D., NIMH, indicated that a significant amount of the NIMH grants provide funding for research in the area of technology and informatics to manage mental health and care. Dr. Stiratt recently attended a large mental health summit sponsored by the NIMH Foundation that had over 2,500 attendees. Speakers included Bill Gates and Francis Kahn. The focus of the summit was mobile technologies and social research. Dr. Stiratt emphasized that to realize the true potential of these approaches, "we have to know where we've been and where we need to go."

Lessons From the Field: Health IT Solutions

Section One: Evaluating the Promise of Health IT To Expand/Enhance Access To Mental Health Care and Prevention

Plenary Session: *A Brief Jaunt Through the History of (Mental) Health IT*
Dr. Robert M. Kolodner, Chief Health Informatics Officer at Open Health Tools, Inc.

Dr. Kolodner began his comments by offering some insights into how research, industry, government, and technology fit together. He emphasized the need to learn from what has been done in the past and not replicate it. Dr. Kolodner pointed out that technology has been experimented with in the health care arena for a long time, especially in mental health. For example, computerized patient records were first developed in the 1960s. "Home-grown" IT systems were developed at premier institutions in the 1970s. In 1985, the Veteran's Administration (VA) disseminated the first technology-based clinical package for front line clinicians. As an early adopter, the VA has been instrumental in testing different models and working out kinks in new models of care. Dr. Kolodner emphasized that there is a rich history in health IT, and that mental health was doing a lot of things in this area early on, such as video, telepsychiatry, and gaming.

In the past, technology applications in health care were "program oriented;" but there has since been a recognition that they need to be "person oriented to tie the different program results together." As an example of this shift, Dr. Kolodner noted that mobile technology (i.e., the personal cellular phone) is something that he is seeing being used in health IT interventions today.

Further, he stressed the necessity to engage the right group of people to work through the disillusionment that is inevitable in any breakthrough research or development initiative. He quoted Dr. William Stead of Vanderbilt University, saying, "Try, fail. Try, fail. Try, succeed, deploy." Dr. Kolodner closed by warning that success will not come when meaningful use of health IT is achieved, but when we have a learning system in place that provides individuals the tools to identify what they need and to make improvements to the system to get it.

Questions and Discussion

1. In the VA system, health IT has two advantages—it is integrated and it's fairly highly adopted in the system. Why hasn't it taken hold outside?

   Highlights from the discussion:
   - No one has inpatient/outpatient integration.

- The VA is an encapsulated system.
- The VA found the workflow that the technology needed to fit into. It took more time to develop the software than to implement.
- Most of the advances were not top down, but were achieved by front-line users.
- The relationship on the outside between vendors and front-line users is not strong.
- The VA system was designed in the 1980s. They are now working on version 2, which they want to share outside of the VA.
- The best health IT system isn't even the Model T yet. It's worth getting started, but we have to improve what's available.
- We can identify ways to work together to help vendors and clinicians innovate and work across enterprises and product lines to develop fully interactive systems.

2. What do you see as the roles of open-source applications and vendors with proprietary products? How can we combine them?

   Highlights from the discussion:
   - For most people, open-source is "my code is published." We have a lot of open-source silos.
   - Eclipse Foundation is a model of success in the private sector of open source where governance was shared with the whole team. Instead of open-source being competitor to proprietor, the competitors were allowed to use it.
   - The model of capturing the market and keeping it exclusive as long as possible hinders progress.
   - You want to enable the competition to advance innovation and progress.
   - If a team member is doing something that stops us from doing something, he is not a good team member.
   - A good, viable market is not vendor driven, but market driven.

Technology Demonstration: Virtual Patient Advocate (Virtual Nurse Agents as Care Extenders)
Brian Jack, Vice Chair, Department of Family Medicine, Boston University School of Medicine

We know that the hospital discharge process needs improvement, but Brian Jack described it as the "perfect storm of patient safety." To be fair, he said that this is not terribly different from other transitions that occur within the medical system.

Of the 38 billion discharges annually, one out of five patients is readmitted at a cumulative cost of between $17 and $20 billion. He pointed out that the impact of depression associated with readmission is enormous.

The Reengineered Discharge Checklist (RED checklist) consists of 11 mutually reinforcing components. In a hospital study, only one of seven people who was given this intervention was readmitted within the next 30 days, resulting in cost savings. Dr. Jack believes this checklist

could be used for mental health as well. Reducing readmission would save billions of dollars each year and people would be healthier.

Dr. Jack introduced a new system being tested at Boston University Hospital to improve mental health discharges. The *Virtual Patient Advocate* (a virtual hospital staffer), emulates face-to-face communication between the discharge nurse and patient. Some of its features include the following:

- Highly interactive and tailored to the patient.
- The software creates sentences from a database of words and phrases as the conversation evolves.
- The Advocate emulates human expressions and actions, such as hand gestures, to express human emotion, such as empathy.
- The Advocate determines competency through "teach-back" (e.g., What day is your next appointment?).
- The patient leaves the hospital with a personalized patient care plan they have discussed with the Advocate.
- Alerts identified by how well the patient understands the instructions are printed out for the releasing nurse to review with the patient prior to discharge.

Although the Virtual Patient Advocate is an expensive proposition, its scope and impact could be enormous. Dr. Jack pointed out that it could be especially helpful for populations with low health literacy. He shared that there was some skepticism regarding how patients might react to interacting with a computerized person. Patients in the study were informed up front that they could opt out after one minute and speak to a live nurse. Stunningly, no one in the trials ended the session early to speak to a real person.

The hospital was half way through their 30-day randomized trial of the system at the time of the Summit. The next phase is a postdischarge, Web-based system that will monitor for adverse events, such as patients not picking up medications or not showing up for appointments. Dr. Jack heightened interest by saying that "online [Virtual Patient Advocate] Louise will be more robust than the 2-day phone call post discharge. It will provide care in the home utilizing health information technology characters."

Questions and Discussion

1. The large majority of the population is more honest with on-screen surveys than face-to-face. The direction we should be going is asking why this technology isn't the standard of care. We are assuming that the gold standard is the doctor or nurse talking to the patient before discharge, but we need to leap over that traditional model of care that requires one-to-one interaction.

2. Do you have plans to use mobile technology—taking Louise home with you in your pocket on your smartphone?
   - Discharged patients can interact with Louise online now.

- A component that would allow Louise to contact the patient to remind them of appointments or follow up on medication use needs to be developed.

White Paper: Evaluating the Promise of Health IT To Expand/Enhance Access To Mental Health Care and Prevention

Greg Clarke, TEP Member, Kaiser Permanente Center for Health Research

Greg Clarke provided highlights from his white paper on access. He noted that some studies now include an economic component to the analyses. It has not yet been determined whether health IT interventions are more or less effective than traditional interventions. Regardless of the results, health IT will still have a role to play in broadening access to care, particularly making services available for priority populations (e.g., rural communities, primary care clinics). Dr. Clarke pointed out the need for research exploring reach and effectiveness of health IT interventions in mental health, mentioning the RE-AIM framework developed by Russell E. Glasgow, Ph.D. (Kaiser Permanente-Colorado) and others. The framework helps researchers assess their programs in the following areas to determine relevance and deliverability.

- ***R****each* – How do I reach the targeted population with the intervention?
- ***E****fficacy* – How do I know my intervention is effective?
- ***A****doption* – How do I develop organizational support to delivery my intervention?
- ***I****mplementation* – How do I ensure the intervention is delivered properly?
- ***M****aintenance* – How do I incorporate the intervention so that it is delivered over the long term?

Section One—Discussion and Wrap-Up: Evaluating the Promise of Health IT To Expand/Enhance Access To Mental Health Care and Prevention
Facilitated by John Deadwyler, The Bernard Consulting Group, Inc.

Questions for Discussion

1. From what you have heard so far, has anything evolved that we should capture to help us advance this field?
2. What are some of the traditional barriers to accessing mental health care—both general access issues and access for priority populations?
3. What are key directions and research methodologies for evaluating the opportunities of health IT to expand and enhance access?
4. How can we develop creative partnerships between industry, academic research, and Federal funding agencies to leverage the speed and flexibility of industry and the research expertise in academics?
5. What might be a funding pathway to support implementation of scientific research?

Highlights of Discussion

There was an energetic debate on incremental change versus innovative change:

- Think differently about the way we provide care.
- Designing development to replace traditional care to save time and increase availability will result in incremental, not innovative, change.
- Examine care in a different way or we will create an electronic version of the current systems of care.
- Both incremental and disruptive innovations are necessary.
- There is inherent tension between innovation (a key criteria to receive NIH grant funding) and moving forward incrementally.
- Distinguish between innovation in care delivery and innovation in tools/technology. They overlap, but are distinct.
- Draw an analogy to the hiring process: If you want to hire someone who is going to make a huge impact, you look for variability. Innovation is creating conflict in the review process, not unanimity. How can we harness this concept of spread to advance innovative projects?

Discussion regarding leveraging and supporting development and implementation of health IT interventions included the following points:

- Bring in payers and reimbursement groups to identify evidence to support policy change and evidence to allow reimbursement schemes to change.
- Consider how this is tied to health care reform to improve access.

- How can current projects be disseminated to get them to market? Should venture capitalists or other funders be included?
- Bringing in funders at this stage would stifle research and innovation and would narrow the field to a few limited solutions.
- Currently, medical records are the property of institutions. Health IT fundamentally transforms care and patients have and hold records in terms of technology and data.
- Do not focus on specialized areas of application (e.g., mental illness). Challenge the diagnostic system; understand how mental health care problems develop in the community.
- Include different expertise in the development process, not just basic scientists—technology experts, consumers, field clinicians, and others who are informed by health care.
- Focus on lowering cost margins; larger groups will help provide more care to more people.
- Networking around the world—providers with providers and assisted care professionals—may be the new model to get innovations out to people.
- Need better clinical phenotypes and better clinical epidemiology to improve systems to identify patients with chronic conditions.
- Find mechanisms to encouraged cutting edge scientists and clinicians to focus on innovation in health IT. Discussion centered on: the grant review process, including and integrating the necessary perspectives, differences between research and the private sector, and quickly disseminating preliminary solutions.
- Need major research initiatives to maximize the uptake of e-health care systems.
- Find ways to expand the pool of people who are working in this area, including those at the highest level.
- Examine models and approaches of other countries using electronic medical records.
- Discuss access with people interested in privacy, confidentiality, and personal control (e.g., consumers, lawyers, ethicists). These kinds of protections are extremely important and are a traditional factor in mental health care.

Section Two: Setting Research Priorities for Technology-Based Mental Health Interventions

Technology Demonstration*: Mental Health Services for Extraterrestrials*

James Cartreine, Program in Behavioral Informatics and eHealth, Department of Psychiatry, Brigham and Women's Hospital

Dr. Cartreine began by stating that mental health problems are the third largest health issue on the NASA space station, following radiation and bone loss. Dr. Cartreine is working with the National Space Biomedical Research Institute to develop self-help software for mental health called the Virtual Space Station. The Virtual Space Station program was self-funded by NASA and involved input from 29 astronauts. Criteria for the NASA program included:

- Must have an "earth benefit," in addition to benefitting the astronauts.
- Must be accessible by astronauts at all times to manage, diagnose and treat their mental health.

Features of the program include the following:

- Users can save their data; data were not transmitted to anyone else.
- Simulation of an actual visit with a clinician.
- Review of the individual's history as well as making suggestions on how to move forward.
- Self-evaluation by the user of how they handled an issue.

The program was tested in a clinical trial involving nonastronauts. It is now available for use on site at a NASA clinic.

Questions and Discussion

1. How did you identify the mental health issues that would be encountered?
   - We interviewed 13 crew members and conducted a qualitative analysis of what they said.
   - The most mentioned issue was cross-cultural misunderstandings.

2. Is this program available on the Internet?
   - It is currently only available on a flash drive.
   - NASA has the rights to the program, but it will be difficult to disseminate.

Presentation: *Mental Health Interventions That Use Technology to Improve Outcomes*
David C. Mohr, TEP member, Professor, Northwestern University, Department of Preventative Medicine

Dr. Mohr asserted that Internet interventions can be standalone. Research is needed to—

- Evaluate efficacy and effectiveness
- Improve and develop delivery models (integration into existing health care systems as well as developing new delivery systems)
- Validate underlying assumptions about health ICT (information and communication technology) interventions
- Explore human factors (i.e., understanding of interactions among humans and technology)

He affirmed that when people do not have social cues, they tend to make positive associations (e.g., meeting someone online and having a positive perception or image of them that is different from reality). The question is how to harness this in technological treatments. Dr. Mohr

concluded by suggesting that we need a new research paradigm that is both efficient and provides adequate information for stakeholders.

Questions and Discussion

1. How do we move this forward more quickly?
   - Partnerships with industry.
   - Mechanisms within NIH to develop funding streams that are more flexible and can move more rapidly.
   - More rapid ways of evaluation (alternatives to randomized controlled trials [RCTs]). See Linda Collins' research at Penn State on methodologies for engineering to assess interventions that could be borrowed for mental health.
   - Development is one element; leveraging other technologies is another key element.
     - We need an adequate warehouse of information.
     - Identify what things need to be proven by evidence-based research and what do not.

Section Two—Discussion and Wrap-Up: Setting Research Priorities for Technology-Based Mental Health Interventions Facilitated by John Deadwyler, The Bernard Consulting Group, Inc.

Questions for Discussion

1. Based on what you have heard, what technology-related interventions merit further systemic research and testing?
2. Are there any areas where we are relatively satisfied with the existing evidence base?
3. How can we develop strategies for practice-based research in health IT for mental health and incorporate technology-based mental health interventions into long-term ongoing care for chronic conditions?
4. Do we have enough to begin implementation mode, or do we need more basic science?

Highlights of Discussion

Technology-related interventions that merit further systemic research and testing:

- Asynchronous technology interventions, such as the scenario approach used by NASA.
  - Address broad populations
  - Develop quickly
  - Look at how we can work more asynchronously with patients.

- ▶ Supportive comments:
  - The people we treat aren't just patients; they're customers.

- The next generation of patients doesn't want to come in and see clinicians face-to-face.
- New devices and technologies are customer-driven and avoid the barrier of poor customer service.

- Active (participative) research—where the patient is involved up front in setting goals and measures—
  - Leads to more rapid cycle in change or adjustments
  - Conducts a series of shorter evaluations with less depth that target clinical improvement instead of build, evaluate, and assess,
  - Differs from RCT, where you are attempting to prove a theory
  - Includes learning from what you discover; designing while you build and evaluate a solution or intervention
  - Includes consumer involvement, which is different from the traditional model of research.

  ▶ Cautions:
  - Active participation involves building trust, which typically takes a long time to establish with a mental health professional.
  - Asynchronous is an add-on approach, not the only approach.
  - Consider what payers will pay for, not what purchasers want to use.
  - Need science behind the interventions to get to the value-added.
  - There is a balance between customer service and good, ethical care.
  - Consumer involvement is common in all of medicine, not just mental health. Need to recognize that there is no shortcut to the RCT process.
  - Have to evaluate the potential for doing harm and consider if it's ethical to implement an untested intervention while conducting trials.

  ▶ Supportive comments:
  - Products in Consumer Reports haven't been tested in trials, but features and functionality are compared based on a standard way of reporting.
  - Once a product is shown to be effective, does there need to be a randomized trial?
  - The Center for Cognitive and Behavioral Therapy has a lot of information about what works and is effective.
  - Data does matter; so does cost effectiveness and consumer market approval.
  - People want to have some control of the process. Control has to be negotiated ad hoc.
  - Most of the things we do in medicine don't have randomized trials behind them.
  - The issue is not either having RCTs or having no RCTs.
  - Presently, health IT interventions don't require FDA approval, as pharmaceuticals do.

  ▶ Ideas:
  - Develop a standard for how health IT interventions are assessed (e.g., safety, user experience) and assign a simple rating scale.

        - Collaborative care model where dozens of studies have shown that an intervention works.
        - Purchasers could use the rating system to make decisions about buying a product.
        - Provide options to the consumer along with implications.
    - Look for the active ingredients across health IT interventions (e.g., software development that is iterative, rapid, and responsive to consumers).
        - Determine what is accepted as evidence and associate it with rigorousness for funding.
        - Behavioral activation is an ingredient for certain conditions. Can this be delivered using health IT?
    - Health IT interventions need a different network and infrastructure to be incorporated into the system; a network R&D infrastructure where people self-test and self-enroll.
        - Address the existing split between payer (Centers for Medicare & Medicaid Services) and research funder.
        - Determine how to fund "good enough" interventions so that they are managed appropriately.
        - Develop online RCTs or scaling RCTs.
        - Examine the workflow process within mental health and how to make it more convenient.
    - Need evidence and ways to evaluate achieving rapid cycle.
        - Find efficient electronic ways to get accurate data about outcomes and how to act on outcomes data.
        - Look for ways to bring data to decisionmaking in a logical way.
        - Use IT methods to get more outcomes data from routine clinical care.
        - Find ways to process outcomes data for clinical decision-makers so they can adopt a more outcomes-driven practice style.
        - Develop "practice-based research."
        - Identify interventions that have shown no harm and meet unmet needs.

Other models to benchmark:

- Engineering methodology for rapid development. Caution: It is limited because "build and they will come" doesn't always work.
- What does the consumer want paradigm. Lots of industries have used this paradigm.
- Anthropology—diffusion of innovation research that can be learned from and deployed. Use focus groups to get input on what it will take to get users to embrace a product.

Agreement among Summit participants about RCTs:

- Necessary, but not sufficient.
- The gold standard, but obviously not necessary because most care is provided without it.
- There is quasi-experimental research in practice.
- Find ways to expedite RCTs.
- What evidence is sufficient at what stages?

Ideas about RCTs or alternative approaches:

- Use today's technology platforms (e.g., online tools, Facebook) to quickly test in the real world as an adjunct approach.
- Look at questions that are most important to customers.
- Look at clusters of symptoms and run trials that way.
- Focus on outcomes, not features or tools, to influence policymakers. Policymakers want to know what happens when you implement something, not what innovation and evaluation is involved in developing the intervention.

Section Three: Furthering the Reliable and Valid Measurement of Mental Health Screening, Diagnoses, Treatment, and Outcomes Through Health IT

Technology Demonstration: *Monitoring Adherence Through Wireless Technology*

Jessica Haberer, TEP member, Assistant in Health Decision Sciences, Massachusetts General Hospital, Harvard Institute for Global Health

Dr. Haberer conducts HIV research in Africa. She stressed the importance of studying medication adherence in real-time because of the highly negative impact of failing to take even one dose of medication. She indicated that social desirability bias (i.e., overreporting good behavior or underreporting bad behavior) is a key risk factor in measurement. Dr. Haberer spoke about using Wisepill, a wireless pill container that transmits a cellular signal when opened, to obtain information in real-time to determine when medications are taken. During the Summit, Dr. Haberer accessed data on a patient in Uganda, showing that she had taken her medications at 7 a.m. that same day. The initial Wisepill pilot followed by just-in-time training increased medication adherence significantly, from 33 to 80 percent IRV/90 percent SMS.

Despite the potential of health IT solutions to improve patient adherence, Dr. Haberer warned that making assumptions about how technology will be used by patients is dangerous.

Questions and Discussion

1. Could you characterize nonadherers vs. adherers?
   - We haven't analyzed the data from the study I talked about.
   - Alcohol is a huge factor for adults

2. What is an acceptable intervention for a lapse in medication use?
   - Capitalize on existing social networks.
   - Use available mobile phones.
   - Use friends and family members to follow up with the individual.

Presentation: *Furthering the Reliable and Valid Measurement of Mental Health Screening, Diagnoses, Treatment, and Outcomes Through Health IT*

Madhukar H. Trivedi, TEP member, Professor of Psychiatry, UT Southwestern Medical Center

Dr. Trivedi began by outlining a typical depression visit at a clinic. It starts with the clinician asking the initial question, "How are you doing?" Twenty minutes later the clinician asks, "How are you sleeping?" The "visit" then concludes with the clinician prescribing medications. Conversation is currently the primary way to find out how the medications are working. He went on to say that "underdiagnosis and undertreatment is the rule in psychology. Less than half of people with major depressive disorder are being treated."

Dr. Trivedi stated that "people don't have a lot of faith in measurements in our culture." In terms of measuring the effectiveness of interventions there is great variability in practice and treatment. Dr. Trivedi suggested that the emphasis is on "just measuring," with little regard to the tool used.

However, the new American Psychological Association guidelines require decisionmaking on a frequent basis, which allows for a second opportunity to measure treatment and resulting outcomes. Dr. Trivedi also spoke about a study—Star*D (Sequenced Treatment Alternatives to Relieve Depression)—that includes an element of measurement in every treatment. The study uses a computerized itemized scale for decision support. The software program "provides a step-by-step guide to assist doctors as they're treating patients."

Questions and Discussion

1. Is it possible that measurement could be Web-enabled?
   - Star*D is not Web-enabled, but the schizophrenia trial is Web-based. We can do assessments at home, based on the system.
   - At Kaiser and Colorado we used a Web-based portal.
   - We need more active partnerships with business to move more quickly.

2. In my primary care practice, patients will send in data when asked. When working in the University psych clinic, I don't get any data. We're not used to measuring.
   - It continues to shock me that we practice mental health care in the absence of evidence. What is it going to take to get clinicians and practitioners to do measurement?
   - Routine measurement standards in mental health would have a significant impact on treatment.
   - Patient-driven behavior will be the first thing that will start changing this. If patients send in data, you will have to do something with it.
   - Another potential modality is a patient directive—self-rating by patients; giving patients accountability to keep track of their data and chart.

Section Three—Discussion and Wrap-Up: Furthering the Reliable and Valid Measurement of Mental Health Screening, Diagnoses, Treatment, and Outcomes Through Health IT
Facilitated by John Deadwyler, The Bernard Consulting Group, Inc.

Questions for Discussion

1. How can health IT help advance and/or improve the diagnosis of mental illness?
2. Are there new aspects of mental health care we should be measuring?
3. What role will personal health records play?
4. How can health IT improve monitoring of consumer access, initiation, engagement, adherence, and retention within mental health treatment and care?

Highlights From Discussion

Do we have enough to begin implementation, or do we need to conduct some basic science research?

- Think about the workflow.
- If the goal is to develop standards, consider the Medicare and Medicaid Electronic Health Records (EHR) Incentive Programs.
- Should consider Continuity of Care Document (CCD) as a starting point—electronic document exchange standard that allows exchange of data between providers.

Aspects of mental health care that need to be measured:

- Monitoring how people operate in the community and at home (e.g., using video system), rather than assuming that monitoring has to be conducted in the clinic.
- Diagnosis, behavior patterns, and cognitive biases. A cellular or smart phone can probably tell a lot about its owner's behaviors (e.g., sleep patterns, typing speed).
- Voice analysis measurement.
- Field of use sensors including devices to capture variability; primarily for early detection.
- Passive, objective measurements, such as self-reporting data through phones.

Cautions:

- Find ways to influence the next round of privacy laws to allow for innovations. There is fear, especially regarding electronic transmissions.
- The Health Insurance Portability and Accountability Act does not stop a person from sharing their data through personal health records.
- Think critically about the pros and cons of experience sampling versus patient reported outcomes.

Support for IT in measuring mental health outcomes:

- IT can facilitate valuable outcome measurement, such as identifying lack of improvement relative to a treatment.
- More feedback on patient conditions over time will encourage data reporting.
- Outcomes monitoring can't be just visit based.
- As health IT becomes more routine and broadly available, it will open the door to policy changes and reimbursement based on outcomes.

Ideas:

- Patients who used kiosks at the VA for routine assessment liked them, but became bored if they did not get some information from the tool. However, providers were least receptive to the data obtained from patient kiosks used at the VA
- Use a three-pronged approach: patient-driven data collection systems, evaluation by providers, and collaboration on treatment.
- Incorporate measurement into the stream of care. How can this resource be leveraged and used to complement more rigorous scientific methods?
- Develop instructive technologies to help individuals manage their own care (e.g., diabetes). Over time, they will gather more information and detect symptoms earlier.

To benchmark:

- OQ45 (Mike Lambert)—provides clinicians with feedback about the patient's progress over time.
    - 11,000 patients
    - Algorithm system that looks at the trajectory of the patient
    - Clinician gets a signal about whether the patient is getting better or worse.
- Project HealthDesign is a funding initiative, and funded projects were to help capture observations of daily living through personal health information technology. [Projecthealthdesign.org]
    - For each condition, there are specific observations that need to be measured and factored.
    - The second level is how to aggregate the data and make it available to providers.
    - Two projects under this initiative have a depression component.

Section Four: Advancing the Adoption, Integration, and Testing of Technological Advancements Within Existing Care Systems

Technology Demonstration: *Utilizing Three Important Screens to Improve Health: The Computer, Cell Phone, and Television*
James Kahn, Professor of Medicine, University of California, San Francisco

Dr. Kahn suggested that if we have more knowledge and resources we can accomplish more. He said that technology can help us do more even without more knowledge. The question is how to bring about the appropriate balance between what we know and what we do with what we know.

Dr. Kahn demonstrated the personal health record system myHERO, which is being studied to help non-tech savvy patients develop skills, such as having an email account and navigating on a computer screen, to manage their own care. The system allows patients to update their information on Google Health and access it from anywhere or give access to their providers. The objective of the study is to help patients use technology to manage their care.

Presentation*: Advancing the Adoption and Integration of Health IT Into Mental Health*
Linda Dimitropoulos, TEP member, Director, Center for the Advancement of Health IT, RTI International

In general, adoption of EHRs is fairly low according to Linda Dimitropoulos. In 2008, there was only 13 to 17 percent adoption across ambulatory settings. One of the major barriers to implementation is cost; but that, according to Dr. Dimitropoulos, will be partially mitigated by Federal funding. All in all, however, less money is spent by behavioral health organizations than their medical counterparts. The challenge, as stated by Dr. Dimitropoulos, is "how to engage patients and providers in new ways and use care in sharing information."

Highlights of Discussion

- Excluding behavioral from current health legislation is a huge barrier.
- A lot of research on electronic health records is incremental. For outside-the-box research, we need a different process for testing, different pilots and usability studies, and a very different research process that can't necessarily be conducted inside a traditional laboratory system.

Section Four—Discussion and Wrap-Up: Advancing the Adoption, Integration, and Testing of Technological Advancements Within Existing Care Systems
Facilitated by John Deadwyler, The Bernard Consulting Group, Inc.

Questions for Discussion

1. How can we further the adoption and integration of health IT interventions for mental health into care settings and EHRs?
    a. Are there barriers unique to mental health settings?
    b. What are the factors that are most predictive of organizational readiness to adopt health IT?
    c. How can those factors be enhanced within organizations?
2. What research is required to help promote and improve meaningful health information exchange between mental health providers and other health care providers, such as primary care and specialties?

Approaches to further adoption and integration of health IT and EHRs:

- Integrate with general health care.
    - Most people dealing with mental health issues have many other health concerns.
    - The fundamentals of measure-based care are the same. Mental health-related initiatives need to leverage efforts already in place.
    - Research conducted in Nebraska confirmed that mental health workers had similar ideas as other medical professionals about how EHRs would improve care and workflow.
    - Mental health service providers have to start talking about how they are part of health care.
    - There is a huge disparity in society on funding mental health. The goal is not just administrative integration, but improved coordination of services. Recommendation: emphasize creating interoperability standards that allow different systems to talk to each other rather than forcing mental health into a medicalized EHR that doesn't serve it well.
    - Focus on patient outcomes rather than the barriers of integration and interoperability.

    - Look at the unintended consequences of separating mental health information from the EHR from the perspective of the provider. If it doesn't relate to how they practice, it's useless.
    - Integration of mental health with general health may already be occurring: over 50 percent of mental health drugs are being prescribed in primary care settings.
- Activate people to take more ownership of their mental health.
- On the provider side, relate the new health IT methods to what practitioners are currently doing.
    - Overcome the barriers of time and cost to providers. Demonstrate the value proposition to them.
- Track progress over time. It can't be a one-size-fits-all approach. It will be tough to sell health IT for mental health into existing systems.
    - Incentives will change (more on the outpatient side than the inpatient side).
- Systems have to be designed with future funding opportunities in mind, not current funding streams, because those will change.
    - Asynchronous care doesn't fit with current funding streams.
    - Need to move to episodic funding, not just funding for one consultation, but for a period of care or care of a population over time.
    - The funding model will need to vary from one community to another.
    - Massachusetts is moving toward a bundled method of billing. Technology is part of the solution if technology-enabled interventions can be shown to reduce cost, are scalable, and encourage patient participation.
- Team up with organizations that are doing this well, such as the VA which doesn't base incentives for over- or under-utilization, but on outcomes.
    - Test the model in a setting where reimbursement issues are minimized so you're doing it to optimize treatment.
    - Look into Health Resources and Services Administration funds for federally qualified health centers to get project funding.
    - Another resource might be Harvard's SMArt Project, "Substitutable Medical Applications, reuseable technology." Create a "medical apps store" based on the iPhone/iPad model of substitutable applications running on a device or platform.

Research opportunities:

- Design new interventions with an understanding of the end users in mind (i.e., patients and providers) and the systems to which they will be introduced.
- Unintended consequences of the separation or integration of mental health information from/with the rest of health care information.
- The organizational level issues associated with implementation—leadership, structures, systems.
    1. Understand why interventions aren't making their way into practice.
    2. Leadership and work flow analyses are critical.
    3. Randomizing the way we approach implementation of health IT at different sites. Learn from industry how this can be done.

Research cautions:

- Research should examine what is optimal; implementation has to focus on what's practical.
- Consider when and how and who should be developing standards. There is a balance between innovation and standardization. There is danger in standardizing too soon.
- Terms are often first coined in research where new concepts are discovered. Subject matter experts need to help populate the terminology before the research reaches a point of maturity where we are collecting data in a systematic way.
- System designers need to deal with the complexities of integration of care versus integration of health IT and not impose it on customers.

Lessons From Industry: Fostering Partnerships Between Industry and Academic Institutions

Plenary Session: *Fostering Partnerships Between Industry and Academic Institutions*
Vikram Kumar, Founder and Chief Medical Officer, Dimagi, Inc.

According to Dr. Kumar, fostering partnerships between industry and academic institutions is about small industry. An example of industry and academic collaboration is the Cogito population-based screening system. This system tracks voice signals to listen to how you speak, not what you say. It can be applied to the clinical setting, enabling the clinician to track where a patient is in terms of their treatment and to intervene when needed. Investigators in the translation process need to come from varied backgrounds and act as domain experts (re/thinkers) and design experts (re/doers). In an effectiveness study, adherence reminders delivered by cell phones were more effective than reminders delivered via beepers.

Environment is key in terms of academic and industrial collaborations. Young entrepreneurs need speed and do not tolerate administrative overhead and bureaucracy that is common with Investigational Review Boards.

Technology Demonstration: *Mental Health and Health IT Research: The Way Forward*
David Whitehouse, Chief Medical Officer, CatalystRx

Dr. Whitehouse spoke about his work at Optum Health Behavioral Solutions. He said that stress accounts for over 7.9 percent of the "total health spend." It's important to consider mental health as more than just mental illness. He cautioned that products like the "smart pill" only track when a person has taken their medications and they begin to be digested. Dr. Whitehouse envisions the future where a person's organs actually provide real-time feedback about what's happening—an early diagnosis or warning of future symptoms. For example, he can foresee a watch or phone sending you the message, "You're at risk." This technology would allow individuals to address a condition before it overwhelms them. Dr. Whitehouse said that through neuropsychology, diagnosis can move beyond asking people how they feel to measuring how their brain is working. He stated this can be done effectively and inexpensively with technology.

The Brain Resource International Database (BRID) is a repository of data that are gathered simultaneously from individuals around the world. The database supports a screening tool that includes the following features:

- The person's age, gender, and education are matched against the data.
- 1.4 million data points are monitored for each patient in the study.
- Initial screening takes less than 10 minutes.

The screen focuses on three aspects of the person's mental state:

1. Negativity bias—stress monitor of the brain (measures psychopathology).
2. Social skills—the person's capacity to accept people in their immediate environment as a help.
3. Emotional resilience—how well the person gets information and processes it.

Dr. Whitehouse suggested that a person's cognitive brain is hostage to his emotional brain. He referenced a report from the United Kingdom, *Mental Capital Through Life*, that lists several factors that impact mental capital, including: education, poverty, stress, and pregnancy. The BRID screening tool includes training exercises for the phone, computer, or other device. A program that monitors breathing rate can be downloaded. The system uses emoticons (e.g., happy face, sad face, confused face) that describe how the person is feeling at any given time and sends messages to multiple people to increase the chance of a response.

Products in development include—

- Games that will allow a person to monitor their mental health.
- Avatars that will be able to interact with a person in their home and serve as a "trusted advisor." The interaction will provide ongoing support, not just when the person has a medical issue.

Plenary Session*: Approach Toward Partnering With Industry (3 E's approach)*
Margaret Morris, Senior Researcher, Intel

Dr. Morris spoke with Summit participants about her work as a clinical psychologist in partnership with engineers in Intel's Digital Health Group. Their research focused on embedded assessment, a technology design strategy to drive preventive health care and early disease detection. This approach addresses barriers to early detection observed through ethnographic research. Health monitoring is integrated into everyday devices and then translated into personalized feedback that supports immediate wellness and long-term disease prevention.

The team has worked on three embedded assessment technologies. The two relating to mental health include Mobile Therapy and Facebook for Health. Mobile Therapy is a mobile coaching system, responsive to physiological sensors, for people whose emotional reactivity poses risk for coronary artery disease. In these projects granular biological and behavioral metrics are translated into psychologically meaningful feedback to motivate change. This research started with pervasive computing using a sensor attached to the chest and has evolved to include mood mapping and breathing exercises.

The second joint project, Facebook for Health, is based on ethnography and uses a system of sensors and ambient displays to support social interaction and prevent cognitive impairment among older adults.

Questions and Discussion

1. In terms of partnerships with industry, why should these companies help sponsor research?
   - Health is one reason people are using technology. The more technology can be part of a person and understand his/her emotional states, the more compelling it will be for them to use it.
   - In early phases of development, it's easier to find partners who are very small and willing to invest to get us to the next level.

2. What suggestions or thoughts do industry reps have to help take this research to application?
   - For each project, get someone who is willing to be the champion to build the product. Make sure they see the big picture, the market for the product. Champions have to be people who are committed to owning the project and seeing it through to the market.
   - Equity and intellectual property rights can be negotiated later; they don't have to be addressed at the research phase.
   - The harsh reality is that most products don't make it to market. When they do, they have morphed and evolved based on business opportunity.

Priorities From the Summit

Large Group Discussion
Facilitated by John Deadwyler, The Bernard Consulting Group, Inc.

Mr. Deadwyler facilitated discussion to identify high priorities from the Summit regarding (1) expanding access, (2) setting research priorities for technology-based mental health, (3) ensuring reliable and valid measurement, and (4) adoption, integration, and testing of technology in existing care systems.

Expanding Access to Health Care

- Something akin to a Practice-based Research Network (PBRN), a working lab where people can find partners for innovative research on health records or interventions. **Strategy**: Pilot it in an environment that is open to experimentation and rapid testing.
- Test different reimbursement models. **Strategy**: Figure out reimbursement first in the new model, then conduct postmarketing surveillance, as opposed to figuring it all out on the front end.
- Capacity building. **Strategy**: Network with a focus on health IT for mental health.
    - Consider the infrastructure needed to support the research before approaching funders.
    - This has the capacity to bring together groups from around the country.
    - Outcome: set of research priorities and a way of implementing what agencies, private sector, and partnerships want to take on.
- Population-based screening for cases or specific issues like suicide that existing systems aren't able to screen for right now. **Strategy**: Focus on traditionally underserved communities and populations who could benefit the most.
- Prioritize ideas according to economic impact, and identify the business sector (potential business collaborators) that stands to profit.
- Increase demand from consumers. **Strategy**: Educate and engage people.
- Focus on health care outcomes, not on screening or measurements or infrastructure, but on tools that record outcomes from patients, indicating improvement in health. Examples include mobile technologies, asynchronous activities, and consumer-driven interventions.
- Technologies that have the attention of young people, such as Web-based tools. **Strategy**: Use Web-based tools to prevent suicide, build resiliency, and enable access to care.
- Approach is the most important factor, based on an analysis of Federal research funding. Elevate the role of the investigator and innovation. **Strategy**: Make sure you have the right people on the team.

Setting Research Priorities for Technology-Based Mental Health

- Computer-based interventions
    - Great potential for delivering evidence-based treatments
    - Identify best practices across problems, devices, and treatments. Behavior change is not limited to mental health.
    - Implement the *Consumer Reports* approach to dissemination.
- Standards—create a modular, extensible, and accessible platform for development of interventions.
    - This will facilitate collaboration, organized research, and entry into research.
    - Fund high-risk research (small grants) that if successful would have a large impact.
- Basic research into how human factors play into mental health problems.
- Develop a research registry for mental health (similar to Web-Neuro, a multimedia research registry).

Reliable and Valid Measurement

- Develop a suite of electronic mental health assessment instruments.
    - Common assessment and measurement framework.
    - Specific initiative on electronic measurement.
    - Use well-established methodology for developing electronic instruments.
    - Ensure interoperability with multiple and different platforms.
    - Consider workflow, consumers, and providers.
- Develop health IT for mental health systems that monitor in real-time patients' successes and failures and produce alerts that are sent to providers to intervene.
- Develop measurements related to demand and action; passive, objective measurements in the environments that help people understand what's going on in their lives and direct them to care. Screening alone is not enough.
    - Consider the greater sense of social integration and attachment.

Adoption, Integration and Testing of Technology in Existing Care Systems

- Organizational improvement and science adoption—research to better understand the roles of organizations, leaders, systems, personnel, and patients, and the science of information, and its applicability to technology and usability.
- Research the effectiveness of various combinations of behavioral health records and general medical records to help integrate care.
- Look at combinations of open source and proprietary software to research coordination of care and consumer outcomes.

Conclusions From the Summit

Summary: *Cross-cutting Comments From the Summit*
Michael Klinkman, TEP member, Professor, University of Michigan Department of Family Medicine

Research Work Force

- Adaptive creative people make things better, innovative creative people make things different. We need both at the table in health IT.
- Need to train a cohort of basic and applied scientists in aspects of health IT for mental health discovery; there are too few to carry out "team science" research.
- We also need to train and support new teams to carry out implementation science research.
- Consumers, lawyers, and ethicists need to be more directly engaged in discussions, especially around privacy, confidentiality, and control over data.

Research Tracks

- Care-at-a-distance may be the new model. A lot of development is designed to substitute for traditional care to save time and increase availability.
- However, it is important to consider delivering care in a different way or changes will simply create an electronic version of the current systems.

Two tracks of research in health IT for mental health

1. The "innovative" (new discovery) track: develops and tests new health IT tools

   Content

   - Basic science of consumer needs and preferences
   - Personal health records: how can IT fundamentally transform care and move to something that patients have and hold ("own") in terms of technology and data
   - Cell phone technology to carry out simple monitoring/feedback
   - Better "clinical phenotypes" to understand clinical symptoms and syndromes as they occur in community, not as restrained by current diagnostic labels
   - Innovative measurement: how people operate in the community and at home (e.g., passive behavior monitoring via call phone, social networking connections, voice analysis) rather than monitoring (e.g., PHQ-9) at clinical encounters
   - Experience sampling (versus "classic" patient report measurement, as with PHQ-9): how does point in time sampling and measurement (experience sampling) fit with more classical summary measures we've used for a long time?

Funding models

- Expand funding opportunities for "high-risk" innovative work, along the lines of Director's Award or Eureka
- Explore academic-industry partnerships
- Funding agency-brokered "tech transfer" with industry partners

2. The "adaptive" track (adoption, implementation, access) track: moving existing health IT tools into the stream of care).

Content

- Disarticulating to identify "active ingredients" across and within health IT interventions
- Cross-national benchmarking (with caveats, as goals of systems vary in terms of mental health care)
- Asynchronous models (examples: measurement, clinical feedback, decision support)
- Workflow integration, specific to clinical setting
- Community extension, uptake, sustainability of efficacious health IT
- "Maintenance" benchmarking of adapted health IT interventions to original standard over time
- Consumer-focused research; customer service

Funding models

- Explore academic-industry partnerships
- Bring in payers and reimbursement groups to identify evidence they need to support policy change; then build support from these stakeholders
- However, be careful because current stakeholders may only embrace incremental innovation
- Demonstration projects; comparative effectiveness trials

Flexible Research Methodologies To Match Type of Research

- Active research (e.g., rapid prototyping, rapid cycles of improve-assess, or PDSA cycles), similar to the "agile method" of software development—iterative, rapid, responsive to consumers
- Implementation science approach for adaptive research
- Quasi-experimental, qualitative, missed-method research designs in community populations
- RCTs for innovation (new discovery) in tools/technology, and discovery.

Appendix: Meeting Participants

Non-Federal Participants:

- David Ahern, Brigham & Women's Hospital
- Wende Baker, eBHIN
- James Cartreine, Brigham and Women's Hospital
- Greg Clarke, Kaiser Permanente Center for Health Research (TEP member)
- Linda Dimeff, BehavioralTech Research, Inc.
- Linda Dimitropoulos, RTI International (TEP member)
- Thomas Doub, Centerstone Research Institute
- Benjamin Druss, Emory University (TEP member)
- Bill Gardner, The Ohio State University
- Jessica Haberer, Massachusetts General Hospital (TEP member)
- Brian Jack, Boston University
- Gene Johnson, Recovery Innovations
- Fred Johnson, Duke University
- James Kahn, University of California-San Francisco
- Michael Klinkman, University of Michigan (TEP Chair)
- Robert Kolodner, Open Health Tools, Inc.
- Vikram Kumar, Dimagi Inc.
- Jim McNulty, MDDA of RI (TEP member)
- David Mohr, Northwestern University (TEP member)
- Margaret Morris, Intel
- Dennis Morrison, Centerstone Research Institute
- Lori Nichols, Whatcom Health Information Network, LLC
- Kavita Patel, New America Foundation
- Paul Pilkonis, University of Pittsburgh
- Bruce Rollman, University of Pittsburgh
- Greg Simon, Group Health Research Institute
- Tom Trabin, Alameda County Behavioral Health Care Services (TEP member)
- Madhukar Trivedi, UT Southwestern Medical Center (TEP member)
- David Whitehouse, CatalystRx
- Peter Yellowlees, University of California-Davis
- Alex Young, University of California, Los Angeles and Department of Veterans Affairs.

Federal Participants:

- Charlotte A. Mullican, M.P.H., Center for Primary Care Prevention and Clinical Partnerships, AHRQ
- Jon White, M.D., Health Information Technology Portfolio, AHRQ
- David Chambers, D. Phil., Division of Services and Intervention Research, NIMH
- Adam Haim, Ph.D., Division of Services and Intervention Research, NIMH
- Robert Heinssen, Ph.D., Director of Services and Intervention Research, NIMH
- Beverly Pringle, Research on Disparities and Global Mental Health, NIMH
- Michael Stirratt, Ph.D., Division of AIDS Research, NIMH
- Yael Harris, Health Resources Services Administration
- Jim Kretz, Substance Abuse and Mental Health Services Administration
- William Riley, National Heart Lung Blood Institute